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IMPLEMENTATION OF THE NAIROBI PROGRAMME OF ACTION FOR THE DEVELOPMENT AND UTILIZATION OF NEW AND RENEWABLE SOURCES OF ENERGY: CONTRIBUTION TO THE UNITED NATIONS CONFERENCE ON ENVIRONMENT AND DEVELOPMENT

Solar energy: a strategy in support of environment and development

Report of the Secretary-General*

The annex below contains section V (An agenda for renewable energy sources in the 1990s and beyond) of the report of the United Nations Solar Energy Group on Environment and Development. Sections I to IV are contained in document A/AC.218/1992/5, annex I.

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* The present report is to be submitted also to the Preparatory Committee for the United Nations Conference on Environment and Development at its fourth session.

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Annex

SOLAR ENERGY: A STRATEGY IN SUPPORT OF ENVIRONMENT AND DEVELOPMENT

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V. AN AGENDA FOR RENEWABLE ENERGY SOURCES IN THE 1990s AND BEYOND

1. The environment, development and security problems associated with the current energy supply system are global. Strong action is needed both within industrialized and developing countries and internationally to bring about a transition to an energy system compatible with a sustainable future. Such an energy system must be based on the efficient utilization of energy, especially at the point of end-use, and on the utilization of renewable energy sources. 1/ Actions conducive to a transition to an energy system based on a renewable energy supply should include policy changes that address six key areas: policy and planning; financing and funding; technology research and development; technology transfer, adaptation and deployment; capacity-building; and institutional arrangements at both the national and international levels. These key areas are discussed in the following sections, with emphasis on recommendations for action.

A. Policy and planning

2. In order to bring about a transition to an energy system based on renewable energy sources, activities should be promoted through large, coordinated, national programmes within the framework of energy strategies compatible with sustainable development, and not as scattered projects. For this purpose, it will be necessary to establish, enlarge or strengthen national institutions responsible for developing, implementing and coordinating these programmes, in the context of an overall national energy policy. National programmes should be the major vehicle for developing cooperation in the field of renewable energy sources, providing a much more efficient way of channelling the flow of, inter alia, new and additional financial resources, to developing countries in particular, and for bringing about cooperation regarding technology development and transfer.

3. A minimum level of market infrastructure and renewable energy activities (in the form of sales, service and maintenance support) is necessary in order to establish and maintain renewable energy systems. Similarly, it is important to be able to take advantage of organizational learning and economies of scale in production to reduce the costs of renewable energy technologies.

4. In the near term, therefore, transitional policies will be needed to break the momentum behind conventional energy systems that has been gained through decades of preferential treatment in the energy market. Temporary investment subsidies linked, for example, to reducing environmental impacts may be called for in order to bring new technologies that promise exceptional performance from environmental, developmental and/or security points of view on to the learning curve.

5. Permanent policies for ensuring a global energy system that is compatible with sustainable development must establish a level playing field on which all

potential supply and demand options compete and are judged on their economic merits alone, free from all kinds of direct and indirect subsidies. In doing this, it is important to incorporate the full costs, including environmental, developmental and security aspects, as well as traditional economic criteria, in evaluations of investment opportunities.

6. A number of policy tools are available to, and are being used by, Governments for affecting energy supply. In one example, legislation is used to keep kerosene prices low so that low-income households can afford to use kerosene for lighting purposes. Additional legislation keeps diesel prices low in order to prevent the use of cheap kerosene in trucks. This has resulted in a remarkable switch from rail to road freight transport. 2/ Other more direct subsidies for conventional fuels provide favourable conditions for oil and gas exploration and insurance of drilling sites, advance surcharges on electricity to secure interest-free funds for utility investments and so forth. Legislation can also promote the use of renewable energy sources. In some jurisdictions, utilities are required to pay small power producers for electricity supplied to the grid on an avoided-cost basis. Such policies supported an expansion of wind and biomass power production during the 1980s.

7. Much of the current use of policy tools in the energy sector steers markets along the conventional supply path and forms market barriers to renewable energy sources. The same tools can be used to discourage energy practices that degrade the environment while promoting those that are environmentally benign and facilitate development.

8. In order to use these tools effectively, Governments will have to assess the effects of existing legislation on the energy sector and make changes where necessary. New, innovative legislative measures may also be needed.

1. Legislative measures

9. Legislative measures aimed at providing equal opportunity for competition within societally acceptable bounds will promote the use of environmentally benign and secure energy systems that capitalize on development opportunities (as do many renewable energy systems).

10. For competition in the market arena to be unbiased, direct and indirect subsidies for conventional energy systems must be removed. Taxes and fees can be used to internalize, through market prices, the environmental impacts associated with the use of specific energy sources and technologies. Performance standards for both energy conversion and end-use technologies can be used to avoid negative impacts that are not easily monetized. Legislation such as utility regulatory policy acts can be used to ensure open access to the energy supply market, and non-discriminatory pricing systems can ensure equal access for private suppliers to transmission and distribution infrastructure (such as electricity grids).

11. Regulatory measures that require the use of renewable energy technologies such as solar water heaters or photovoltaics in certain applications/situations should be considered.

12. National legislation will increasingly be influenced by the regional and/or global environmental concerns addressed in international agreements and conventions. A global climate convention could, for example, have a great influence on energy-related national legislation in many of the countries ratifying it.

2. Full costing of environmental impacts

13. In most countries, energy policy and planning are almost entirely based on narrow definitions of costs. Only direct monetary costs and benefits are considered; resource depletion and social and environmental impacts are generally excluded. This type of approach inherently favours such energy sources and systems as fossil fuels, nuclear power and unsustainable use of biomass that have substantial external environmental, social and resource-depletion costs.

14. The first step towards promoting renewable energy sources is to establish policies that ensure that social and environmental costs and benefits are internalized by the market, thus reflecting the true total costs in economic comparisons of different energy options. Doing this is in line with the polluter-pays principle.

15. Progress has been made in the development of methodologies for incorporating environmental costs and benefits in energy prices and reflecting them in policy and planning. There is an urgent need to continue this work and to harmonize methods at the international level, taking individual countries' resources and traditions into account.

3. Support of policy planning

16. The actions taken within countries must be seen in their international context in order to meet the global goals of protecting the environment, achieving continued economic development and maintaining world peace. It is important, therefore, that individual countries collaborate in international forums designed to achieve those goals. Part of that collaboration should include participating in an ongoing dialogue regarding renewable energy policy and experiences. To support such a dialogue, individual countries should report to the international community on their domestic policies and national programmes of action for promoting the development and utilization of renewable energy sources.

17. International cooperation is essential to a uniform approach to energy pricing, in order to ensure that national industrial competitiveness is not used as an excuse for delaying action and that energy-intensive industries do not relocate to countries with less restrictive legislation.

4. Utility planning

18. The role of utilities should expand - from being traditional energy suppliers, they should also become purchasers of energy based on renewable resources from small producers. Achieving this may require regulatory action and a reorganization of the utility industry. Planning methods should be developed with the objective of optimizing electricity production, distribution and end use, as is already done by some utilities. The role of demand-side management, in particular, is becoming increasingly important. Diffusion of those methods would favour dispersed electricity generation, while decreasing the total cost of energy services.

19. Certain technologies for utilizing renewable energy sources, especially photovoltaic power production, are sufficiently mature that they pose little risk to utilities and other investors. They should, therefore, be evaluated at a lower discount rate than is accorded conventional thermal power plants for which future operating (fuel) costs are uncertain. Because the levelized energy cost is highly sensitive to discount rates, current practices penalize unnecessarily such capital-intensive technologies as photovoltaics.

20. The use of renewable energy sources, such as biomass, in the agricultural sectors can be improved by means of organizational mechanisms such as cooperatives and third party investors.

B. Financing and funding

1. Transitional subsidies

21. In all countries, government funds can be allocated in the form of special credit facilities for industrial development or transitional subsidies for specific types of renewable energy systems. The level of subsidy depends on the relative costs of energy alternatives and the level of political will devoted to promoting renewable energy sources. These subsidies could gradually be reduced as production costs decrease. One successful example of such a scheme is the Government of Denmark's support of the windmill industry through subsidies to windmill buyers. Initially, the Government subsidized 30 per cent of the investment. The subsidy was gradually reduced and eventually removed as new windmill investments became cost effective. 3/

2. Capital availability

22. It is of critical importance that the share of energy sector investments devoted to utilizing renewable energy sources increase in all countries. Without such a shift in investment shares, the contribution of renewable energy sources to total energy supply cannot be expected to increase.

23. When the question of financing energy systems is addressed, it is necessary to differentiate between the situations in developing and

industrialized countries. In addition, it is important in the developing country context to consider the different requirements for large-scale centralized supply and decentralized rural development needs.

24. In industrialized countries, appropriate use of the measures discussed above would, ideally, lead to a situation where decision makers would increasingly invest in technologies that utilized renewable energy sources based on straightforward assessments.

25. The share of World Bank energy-related loans directed towards renewable energy sources in developing countries is only 10 to 15 per cent, excluding large-scale hydropower, of a total annual energy expenditure of $2.5 to $4 billion, and 40 to 50 per cent if large-scale hydropower is included. 4/ This level of support can be compared with the World Bank estimate that the investment needs in developing countries in the electricity sector alone amounts to some $100 billion per year during the 1990s. 5/ This situation restricts renewable energy system development and implementation. The high initial investment costs associated with many renewable energy technologies compared with fossil-fuel-based systems (even in cases where total costs are low) particularly restricts broad deployment of renewable energy systems.

26. In all countries, in particular in the developing ones, the availability, cost and distribution of capital are important factors determining investment in renewable energy sources. In addition to existing allocations, new and additional financial resources should be made available to finance investments in renewable energy technologies and programmes. The share of World Bank energy-related loans that are allocated to the utilization of renewable energy sources (other than large-scale hydropower) should increase, initially to at least 20 per cent.

27. For rural applications the situation is different, because decentralized uses of renewable energy sources coupled with end-use efficiency may require smaller investments than extending the central supply infrastructure. Local small-scale credit facilities available to households and local organizations can be crucial in such cases. A study of the Dominican Republic, for example, concluded that almost 20 per cent of the rural households without access to electricity could afford a domestic photovoltaic system if small-scale loans at reasonable interest rates were made available. 6/

3. International funding agencies

28. Agencies participating in multinational and bilateral development cooperation should coordinate their activities under the guidance of the Governments of countries where cooperation is taking place.

29. In order to strengthen the role of renewable energy sources in multilateral and bilateral development cooperation, there should be a shift from projects to coordinated national programmes that are an integral part of social and economic development.

30. Experience gained from the implementation of the Nairobi Plan of Action for the Development and Utilization of New and Renewable Sources of Energy has demonstrated that the existing international financing systems, in their present form and level of activity, are inadequate for promoting the increased utilization of renewable energy sources. Existing funds and mechanisms should be improved and strengthened. The Energy Sector Management Assistance Programme (ESMAP), established by the United Nations Development Programme (UNDP) and the World Bank, should support the development of national energy strategies defining an increased role for renewable energy sources and the preparation of national programmes of action on renewable energy sources. A revised Global Environment Facility (GEF), established jointly by UNDP, the United Nations Environment Programme (UNEP) and the World Bank, should, inter alia, make special allocations for financing national programmes on renewable energy, in particular in the developing countries. The future role of the United Nations Trust Fund for New and Renewable Sources of Energy should be reviewed with a view to integrating it with other financing mechanisms.

31. New mechanisms should be considered in order to make renewable energy a major feature of the new energy agenda. The funding mechanism of a global convention on climate change could play a major role in financing the implementation of national programmes of action on renewable energy, in particular in the developing countries. The strong international institutional arrangement needed for promoting renewable energy sources (see para. 74 below) should be the framework for providing policy guidance to relevant funding mechanisms regarding renewable energy.

32. One option for providing the necessary funds for renewable energy activities, at either the national or international level, is to impose environmental impact taxes (such as carbon/energy taxes) on energy sources, such as those being discussed within the European Community and in several European countries. Such taxes will be especially interesting if the revenues that they generate can be earmarked for investments in the renewable energy sector.

C. Research and development

33. Many cost-effective renewable energy technologies currently exist and only need appropriate market conditions and removal of barriers in order to penetrate energy markets. But there is large untapped potential for harnessing all renewable energy forms and much could be gained in terms of economics, availability, reliability and applicability of renewable energy technologies by increasing scientific and technological research and development efforts. This is clearly shown in a White Paper on renewable energy sources from five national laboratories in the United States 7/ and in a state-of-the-art review prepared for the United Nations Solar Energy Group on Environment and Development. 8/ In the White Paper it is estimated that a twofold to threefold increase in funding would enable the United States to cost-effectively raise the contribution of renewable energy sources from the present 4 per cent to about 50 per cent of present total energy demand.

34. The areas with greatest potential for improvement are those that are innovative, such as photovoltaics and the sustainable utilization of biomass. Efforts in those areas should include basic and applied scientific research and the adaptation of existing renewable energy technologies for applications in new and varied contexts.

35. The energy research and development budgets of the countries members of the International Energy Agency (IEA) described in document A/AC.218/1992/5 (table 3) illustrate the low level of effort devoted to renewable energy research and development (R&D) in industrialized countries. They also indicate that renewable energy R&D could be adequately funded by shifting priorities for existing energy research, development and demonstration (RD&D) financial resources. A shift in funding priorities should be extensive enough to increase public funding of renewable energy sources by at least a factor of three, on average, within five years.

36. It is important to advance research and development efforts on renewable energy sources in developing countries, to facilitate self-reliant development and to orient the work to take into account national and regional considerations regarding natural resources and cultural conditions.

D. Technology transfer, adaptation and deployment

37. Transfer of both knowledge and technology, in the form of capabilities for producing and deploying components and entire systems, is essential for successfully utilizing renewable energy resources at the global level.

38. Making technologies available is an essential component of the development process. The resources needed for acquiring and applying new technologies, both in terms of funds and skills, are inadequate. There is a great need for transferring knowledge and technology from industrialized to developing countries on favourable and concessional terms. This process poses much greater challenges than exchange among industrialized countries.

39. Adaptation to local conditions is necessary, although not always sufficient, for successful technology transfer to developing countries. Experience gained primarily from aid-based transfer activities in the past two to three decades clearly indicates that technology transfer usually fails when a process of adapting technologies to specific conditions in the recipient country is not undertaken. The many deserted or non-operational industrial and energy plants are evidence of ambitious attempts to introduce new technologies into societies without taking into account local conditions, such as lack of resources or skills to secure maintenance, and inadequate supply of raw materials, fuel and spare parts. In many cases, lack of genuine cooperation objectives and inadequate institutional arrangements in both donor and recipient countries has led to failure of so-called demonstration projects. It is also important to distinguish between the completely different problems faced when dealing with centralized and with rural applications.

40. Ability to assess the specific requirements of a given technology and the ability to meet them is of primary importance in developing countries. Therefore, international institutions in general, and the United Nations system in particular, should provide support for establishing endogenous expertise in evaluating new technology applications in specific local and regional contexts to countries receiving technologies, and, in general, carry out technology assessment in the energy area.

41. The transfer of technologies that utilize renewable energy sources is not qualitatively different from that of other energy technologies. The main practical difference is that most renewable energy technologies are new and rapidly developing in comparison to well-established conventional technologies. A special effort is needed, therefore, to ensure that renewable energy technologies are made available in developing countries, together with the knowledge necessary for developing endogenous production, operation and maintenance.

42. Present international funding structures favour the transfer of knowledge and technologies from the North to the South. Several of the developing countries, such as India, China and Brazil, have developed expertise and technologies that may be more easily applicable in other developing countries than systems from industrialized countries. It would be valuable, therefore, to promote direct South-South transfer of renewable energy systems.

E. Capacity-building

43. Capacity-building includes training, education and awareness building. These are crucial components in creating sustainable societies.

44. As a basis for broader action towards promoting the utilization of renewable energy sources, it is necessary to generate both public and political awareness of energy-environment issues, and scientific and technical knowledge as a basis for development, planning and implementation of renewable energy systems.

45. Governments should build on existing educational systems and training institutions, focusing especially on including renewable energy and other energy-environment issues at all education levels and generating awareness among energy consumers through the following:

(a) Extension programmes involving local non-governmental organizations in local planning through information training and support, for instance, in the form of local energy offices;

(b) Demonstration projects based on local interest and carried out in collaboration with local organizations and academic and government institutions.

46. A global network of internationally supported centres of excellence on new and renewable energy sources should be established, along the lines described in the Castel Gandolfo colloquium. 9/ The centres should be responsible for research and development, as well as technical training programmes for technicians, planners and representatives of non-governmental organizations. The centres should work in close collaboration with national or regional development centres and national authorities. They could also provide a forum for information exchange and could function as a focal point for interregional cooperation in their fields of competence. Most of the centres should be located in developing countries. Their activities should include:

(a) Assessment of locally available and accessible supplies of renewable energy;

(b) Project planning and economic analysis methods;

(c) Applied research into applications and adaptation of specific renewable energy technologies;

(d) Environmental impact assessment and costing;

(e) Collaborative research for development of renewable energy systems.

47. Training and education activities cannot be viewed in isolation from the activities recommended, in particular with respect to those related to technology transfer, adaptation and deployment. Utility engineers and technicians may lack the knowledge required to install and operate renewable energy systems. Increased efforts in the area of training and education are, therefore, crucial both for creating awareness and for ensuring successful implementation of renewable energy technologies. Many of the activities recommended above aim at strengthening the capacity for decentralized applications. It is equally important to ensure that planners and policy makers are aware of the physical and technical potentials of the various renewable energy technologies for large-scale centralized applications, and of the environmental costs associated with conventional energy systems.

48. Government collaboration with non-governmental organizations is of increasing importance in the energy field and has shown great promise, both in the areas of training and of transfer and adaptation of renewable energy technologies. Collaboration at that level should be increased.

F. Institutional arrangements

49. The areas discussed in the previous sections of the present report indicate that promoting renewable energy sources affects not only energy and environmental policies but also agricultural, transport, industry and research policies, and policies regarding housing and regional development. Strong institutional mechanisms are therefore needed, both at the national and the

international level, to assure the necessary integration of renewable energy concerns in relevant policy fields and to coordinate the work that is already ongoing in several institutions. Such mechanisms should play a visible and powerful role in the overall policy-formulating process.

50. At the national level, institutions should be established with a view to strengthening the role of renewable energy sources, and given the mandate to promote the utilization of renewable energy sources through formulating integrated energy policies and programmes, carrying out education, training and information programmes; coordinating relevant policies and programmes and directing research, development and demonstration programmes. The following areas should be considered in this context, in addition to the areas discussed in earlier sections of the report.

51. One lesson to be learned from the implementation of the Nairobi Programme of Action is that it is important to formulate targets. To establish targets for contributions of the various renewable energy sources to energy supply, commensurate with the discussed time-frames of technical and economical feasibility, is essential. Targets should be derived from environmental (e.g., carbon dioxide (CO_2) and other emissions reductions), as well as social and developmental objectives. Such targets should be introduced as soon as possible.

52. One example of formulating targets is given in the São Paulo Declaration, 10/ with respect to rural electrification. The aim of that Declaration is to help meet the basic needs of 2 billion rural poor by installing 1 million basic photovoltaic systems by 1995, thereby reaching 1 per cent of the world's rural poor, and expanding the programme to reach 10 per cent of the rural poor by the end of the century.

53. To enhance the dialogue within the international community on the utilization of renewable energy sources, each country should report annually to the international community on its policies and national programme of action for promoting renewable energy sources, and progress made in their implementation.

54. There is a need to establish and implement procedures for recording statistical data on applications of renewable energy sources in each country in a harmonized manner, to facilitate the use of such data at the international level.

55. At the international level, arrangements must be made, in close collaboration with existing international and national institutions and non-governmental organizations, to strengthen international cooperation for promoting the utilization of renewable energy sources. Such arrangements should, inter alia, stimulate research, development and demonstration in renewable energy technology, intensify broad dissemination and application of available renewable energy technologies, and provide for information exchange and manpower training for the production and use of such technologies.

56. Policy planning needs to be promoted and supported, inter alia, by organizing annual dialogues with individual countries, based on national reports on renewable energy policies and programmes of action. Such annual dialogues have proved valuable in the economic sector.

57. An international body should gather statistics from individual countries on, and perform ongoing evaluations of, renewable energy applications.

58. Studies on new technological developments, techniques and strategies for identifying and evaluating the future role of renewable energy sources in global energy supply should be prepared and disseminated.

59. Energy issues are integral to most other societal activities. This implies a need to coordinate international activities aimed at utilizing renewable energy sources.

60. There is a need to coordinate the exchange of information and experience on research, development and applications of renewable energy technologies.

61. Policy guidance should be provided to relevant funding mechanisms, in the form of criteria for selecting projects and guidelines for formulating and implementing them, and their activities aimed at utilizing renewable energy sources should be regularly reviewed.

62. The international community has responded to energy-sector challenges in several ways. At present, existing institutional arrangements are focused on energy supply. Within the United Nations system, efforts are directed at nuclear power, oil, natural gas, coal and large-scale hydropower. Secretariat functions for addressing energy issues are assigned to the following units within the United Nations system:

(a) The Office of the Director-General for Development and International Economic Cooperation is responsible for all matters related to the Economic and Social Council of the United Nations. It is the highest United Nations Secretariat body for energy matters, although there is no special section for energy. The Office has a total staff of only a dozen people. Following the United Nations Conference on New and Renewable Sources of Energy, which was held at Nairobi in August 1981, the post of Special Coordinator, New and Renewable Sources of Energy, was created within the Office. The Special Coordinator, however, has been given no support staff. He serves as Chairman of the Ad Hoc Inter-agency Group on New and Renewable Sources of Energy and manages the United Nations Trust Fund for New and Renewable Sources of Energy;

(b) The Department of International Economic and Social Affairs provides information and analysis. The Energy Branch follows the energy markets, conducts special studies and, together with the Department of Technical Cooperation for Development and the Office of the Director-General, provides services to the Committee on Natural Resources and the Committee on the Development and Utilization of New and Renewable Sources of Energy;

(c) Other energy-related work is carried out by several United Nations units. The Department of Technical Cooperation for Development has an energy section in the Natural Resources and Energy Division. It provides services for the Committee on Natural Resources. The International Atomic Energy Agency (IAEA) is in charge of a single energy source: nuclear energy. The Centre for Science and Technology for Development was established to follow up the Vienna Programme of Action for Science and Technology for Development. The regional commissions have energy activities of varying intensity. United Nations bodies and organizations that have energy programmes in line with their mandates and constituencies include the following: the Food and Agriculture Organization of the United Nations (FAO), UNDP, which, inter alia, has operated the Energy Sector Management and Assistance Programme together with the World Bank, the International Labour Organisation (ILO), the United Nations Environment Programme (UNEP), the United Nations Industrial Development Organization (UNIDO) and the United Nations Institute for Training and Research (UNITAR).

63. Outside the United Nations system, important energy activities are carried out by regional organizations such as the Latin American Energy Organization (OLADE), the regional energy organization for Latin America, and IEA, a cooperative body for most of the industrialized countries. The World Energy Council is an important forum for the energy industries. Renewable energy sources, except for large-scale hydropower, receive limited attention in these organizations.

64. Renewable energy sources have not been given priority within the international institutional structure, although most of the functions needed have been assigned to some institution. The weak and scattered position of renewable energy sources in the present structure of international institutions is one of the reasons why more was not achieved in this area during the 1980s. This is not in line with what would be required to make use of the opportunities in this area to support environmental, development and security goals.

65. It is concluded that a strengthened international institutional structure is required.

66. There are several options to consider with a view to strengthening the international institutional structure for promoting the utilization of renewable energy sources.

67. One option is to strengthen the existing intergovernmental mechanism of the Committee on the Development and Utilization of New and Renewable Sources of Energy through, inter alia, a review of its mandate; regular support by a group of intergovernmental experts for better preparation of the Committee meetings (including, inter alia, evaluation and analysis of renewable energy technologies, areas for detailed discussion and other relevant subjects); and strong political support from Governments by ensuring high-level participation in the Committee meetings.

68. In this regard, the present staff and facilities of the secretariat supporting the Committee should be strengthened accordingly. The creation of a special department for renewable energy sources, located inside an existing organization, could also be considered.

69. Another option is to establish a new intergovernmental body, with secretariat support being provided by a new institutional body. This may take the form of an open-ended intergovernmental committee with a new and enlarged mandate with regard to renewable energy sources, within the purview of the United Nations or be established as an independent body with a United Nations mandate.

70. Accordingly, the new institutional body may be either a new United Nations agency or an independent international agency.

71. The experience in the decade after the Nairobi Programme of Action indicates that more restricted changes, such as those discussed above, are not likely to be sufficient to create the dynamics needed for the present, new situation. A department in an existing organization would be possible, if there were a suitable host. This is not the case, because already existing institutions have clear mandates that are not easily adapted to the new tasks to be performed. In addition, the existing structures within present organizations are not conducive to carrying out new tasks with the vigour that is now needed.

72. A new institutional structure for renewable energy sources may be considered as part of a larger institutional framework for the broader task of supporting, in an integrated manner, the transition to environmentally safe and sound energy systems compatible with sustainable development. Such energy systems must increasingly be based on the use of renewable energy sources and on improved energy efficiency in energy end-use and supply. Such broader solutions must be considered, inter alia, in connection with a convention on climate change.

73. It is recommended that a new agency be established. Its role will be to promote renewable energy sources, not only with respect to energy and environmental policies, but also agricultural, transport, industry and research policies, and policies regarding housing and regional development. The specific needs described in paragraphs 56 through 61 should be met by this agency. The creation of an international renewable energy agency, with sufficient political and financial support from Governments to carry out its tasks, would be a strong signal that an increased role of renewable energy sources is required to deal with problems of environment, development and security.

74. The establishment of an international renewable energy agency does not imply that all activities by existing bodies should be integrated in the new agency. In most instances, it would be efficient to continue the renewable energy work performed by existing bodies, but with a more pronounced focus and coordination. Also, more limited institutional changes in existing bodies may

be appropriate, in order to strengthen their efforts to develop and utilize renewable energy sources.

Notes

1/ See the World Commission on Environment and Development, Our Common Future (Oxford and New York, Oxford University Press, 1987) and J. Goldemberg and others, Energy for a Sustainable World (New Delhi, Wiley Eastern Limited, 1988).

2/ A. K. N. Reddy, "Energy strategies for a sustainable development in India", in Conference Proceedings: Global Collaboration on a Sustainable Energy Development, N. I. Meyer and P. S. Nielsen, eds. (Technical University of Denmark, April 1991).

3/ Ministry of Energy of the Government of Denmark, Energy 2000: A Plan of Action for Sustainable Development (Copenhagen, Danish Energy Agency, April 1990).

4/ The Nordic United Nations Project, "Towards sustainable energy development: the energy activities of the United Nations system and the development banks", report No. 1 (1989).

5/ Edwin A. Moore and George Smith, "Capital expenditures of electric power in the developing countries", World Bank Industry and Energy Department, February 1990.

6/ D. Lovejoy, Electrification of Rural Areas by Solar PV, study prepared for the Department of Technical Cooperation for Development of the United Nations Secretariat, September 1991.

7/ United States Department of Energy, The Potential of Renewable Energy: An Interlaboratory White Paper (SERI/TP-260-3674) (Golden, Colorado, Solar Energy Research Institute, March 1990).

8/ T. B. Johansson and others, eds., Fuels and Electricity from Renewable Sources of Energy (Washington, D.C., Island Press, 1992 [in press]).

9/ See note by the Secretary-General on the colloquium of high-level experts on new and renewable sources of energy (A/AC.218/14).

10/ Adopted by the International Workshop on Mass Production of Photovoltaics: Commercialization and Policy Options, held in São Paulo in September 1991.